REMARKS

By this Amendment, claims 3, 10, 11 and 18 have been amended. No claims have been cancelled or newly added. Therefore, claims 1-24 remain pending. Support for the instant amendments is provided throughout the as-filed specification. Thus, no new matter has been added. In view of the foregoing amendments and following comments, allowance of all the claims pending in the application is respectfully requested.

Applicant notes with appreciation the Examiner's indication that claims 1 and 2 are allowed.

Claims 3, 4, 7, 9-12, 15, 17-19, 22 and 24 were rejected under 35 U.S.C. §102(e) as allegedly being anticipated by U.S. Patent No. 6,819,434 to Hill ("Hill"). Applicant respectfully traverses these rejections.

The cited portions of Hill fail to disclose, teach or suggest an interferometer system for measuring displacement along at least two directions in an XYZ system of co-ordinates, of an object in a plane substantially parallel to an XY plane, said interferometer system comprising, *inter alia*, a beam generator configured to generate a plurality of radiation beams, said beam generator comprising a beam-splitter block having a beam-splitting surface, wherein said beam-splitting surface of the beam-splitter block is configured to split at least one first beam of said plurality of radiation beams into a first measuring beam and a first reference beam, said first reference beam only being reflected by one or more first reference mirrors located in a fixed position with respect to said beam-splitter block, said first measuring beam being reflected by a first measuring mirror area of said plurality of measuring mirror areas, and wherein said beam-splitting surface of the beam-splitter block is configured to split at least one second beam of said plurality of radiation beams into a second measuring beam and a second reference beam, said second measuring beam being reflected by a second measuring mirror area of said plurality of measuring mirror areas, and said second reference beam being reflected by a first reflector that is fixedly positioned with respect to said beam-splitter block and by at least one third mirror area, which is movable with respect to said beam-splitter block, and wherein, in use, the second reference beam associated with the at least one second beam exits the first reflector in a direction substantially orthogonal to the direction of the first reference beam associated with the at least one first beam exits the beam-splitter block and away from the beam-splitter block, as recited in claim 3.

The cited portions of Hill describe an interferometer system 200 including a high stability plane mirror interferometer (HSPMI) and an angular displacement interferometer. Radiation from a radiation source 10 is incident on a non-polarizing beam splitter 220 and is split into radiation components 282 and 284. *See*, Figures 2a-c of Hill. The radiation component 284 is directed to the HSPMI by mirrors 231 and 233 and then is incident onto a polarizing beam splitter 230. The beam splitter 230 splits the radiation beam into a reference beam 295 and a measuring beam 291, which are used by a detector 272 to measure linear displacement of the object 280. *See*, column 14, lines 58-67 and column 15, lines 1-30 of Hill. The radiation component 282 is directed to an angular displacement interferometer that includes a polarizing beam splitter 240 and onto reflectors 242 and 246 and then onto the object 280. *See*, column 15, lines 31-56 of Hill. The beam splitter 240 splits the radiation component 282 into measuring beams 293 and 294, which are used by a detector 276 to measure angular displacement of the object 280. *See*, column 14, line 27-column 15, line 57 and Figures 2A-2C of Hill.

However, the cited portions of Hill teach a multiple beam-splitter arrangement including the beam-splitter 220, the angular displacement interferometer including the beam-splitter 240 and associated reflective components 242, 243, 244, 245, and the plane mirror interferometer including the beam-splitter 230 and retroreflector 232. This is in striking contrast to claim 3 in which a same beam-splitting surface of the beam-splitter block is configured to split at least one first beam of said plurality of radiation beams into a first measuring beam and a first reference beam and is configured to split at least one second beam of said plurality of radiation beams into a second measuring beam and a second reference beam. None of the beam splitters 220, 230 and 240 include a beam-splitting surface that is configured to split the radiation beam as defined in claim 3. Thus, for at least these reasons, the cited portion of Hill cannot anticipate claim 3.

Claims 4, 7 and 9 depend from claim 3 and are allowable by virtue of their dependency from claim 3 and for the additional features recited therein.

As indicated above, claim 10 has been amended. In particular, claim 10 has been amended to recite similar features as in claim 1. Thus, claim 10 is allowable for at least similar reasons as claim 1 and for the features recited therein. For example, as noted in the Office Action, the cited portions of Hill do not disclose, teach or suggest an interferometer system comprising, *inter alia*, a beam-splitter configured to split a beam associated with said

plane mirror interferometer system and a beam associated with said differential plane mirror interferometer system into respective measuring beams and respective reference beams; at least one measuring mirror fixedly connected to said one of the supports and comprising a plurality of measuring mirror areas; at least one reference mirror comprising one or more reference mirror areas, and wherein, in use, a direction of propagation of the reference beam associated with the differential plane mirror interferometer system just before incidence on a reference mirror is in a direction substantially orthogonal to the direction of the reference beam associated with the plane mirror interferometer just before incidence on a reference mirror and away from the beam-splitter.

Claim 11 recites similar aspects as claim 3 and is allowable for at least similar reasons as discussed above with respect to claim 3, and for the additional features recited therein. The cited portions of Hill fail to disclose, teach or suggest a lithographic apparatus comprising, *inter alia*, an interferometer system configured to measure displacement of one of the supports, wherein said interferometer system comprises, at least one measuring mirror fixedly connected to the one of the supports, said at least one measuring mirror comprising a plurality of measuring mirror areas; at least one reference mirror comprising one or more reference mirror areas that are configured to prevent beams from passing through said reference mirror; a beam generator configured to generate a plurality of beams, said beam generator comprising a beam-splitter block having a beam-splitting surface; and a plurality of radiation-sensitive detectors configured to convert radiation beams reflected towards said detectors into electric measuring signals, wherein said beam-splitting surface of the beam-splitter block is configured to split at least one first beam of said plurality of radiation beams into a first measuring beam and a first reference beam, said first reference beam only being reflected by one or more first reference mirrors located in a fixed position with respect to said beam-splitter block, said first measuring beam being reflected by a first measuring mirror area of said plurality of measuring mirror areas, wherein said beam-splitting surface of the beam-splitter block is configured to split at least one second beam of said plurality of radiation beams into a second measuring beam and a second reference beam, said second measuring beam being reflected by a second measuring mirror area of said plurality of measuring mirror areas, and said second reference beam being reflected by a first reflector that is fixedly positioned with respect to said beam-splitter block and by at least one third mirror area, which is movable with respect to said beam-splitter block, and wherein, in use, the second reference

beam associated with the at least one second beam exits the first reflector in direction substantially orthogonal to the direction the first reference beam associated with the at least one first beam exits the beam-splitter block and away from the beam-splitter block, as recited in claim 11.

Claims 12, 15 and 17 depend from claim 11 and are allowable by virtue of their dependency from claim 11 and for the additional features recited therein.

Claim 18 recites similar aspects as claim 3 and is allowable for at least similar reasons as discussed above with respect to claim 3, and for the additional features recited therein. The cited portions of Hill fail to disclose, teach or suggest a device manufacturing method comprising, *inter alia*, determining a position of one of the supports with an interferometer system, the determining including splitting at least a first beam of a plurality of beams, using a beam-splitting surface of a beam-splitter block, into a first measuring beam and a first reference beam, said first reference beam only being reflected by one or more first reference mirrors located in a fixed position with respect to said beam-splitter block, said first measuring beam being reflected by a first measuring mirror area of a plurality of measuring mirror areas, the plurality of measuring mirror areas part of at least one measuring mirror fixedly connected to the one of the supports, and splitting at least a second beam of said plurality of beams, using the beam-splitting surface of said beam-splitter block, into a second measuring beam and a second reference beam, said second measuring beam being reflected by a second measuring mirror area of said plurality of measuring mirror areas, and said second reference beam being reflected by a first reflector that is fixedly positioned with respect to said beam-splitter block and by at least one third mirror area, which is movable with respect to said beam-splitter block, and said second reference beam being reflected in a substantially orthogonal direction with respect to the first reference beam by the first reflector and away from the beam-splitter block, and converting beams which are reflected towards detectors into electric measuring signals, as recited in claim 18.

Claims 19, 22 and 24 depend from claim 18 and are allowable by virtue of their dependency from claim 18 and for the additional features recited therein.

Thus, Applicant respectfully requests that the rejections of claim 3, 4, 7, 9-12, 15, 17-19, 22 and 24 under 35 U.S.C. §102(e) based on Hill be withdrawn and the claims be allowed.

Claims 8, 16 and 23 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Hill. Applicant respectfully traverses this rejection because a *prima facie* case of obviousness has not been established.

Dependent claims 8, 16 and 23 are allowable at least by virtue of their dependency from claims 3, 11 and 18, and for the additional features they recite individually. As noted above, the cited portions of Hill do not disclose, teach or suggest the features recited in claims 3, 11 and 18.

Moreover, the Office Action concedes that Hill fails to disclose or teach the aspect of the plurality of radiation beams comprises at least three first radiation beams arranged to occupy a polygonal volume and at least one second radiation beam arranged to be in a position outside a polygonal volume. [Office Action, page 12]. The Office Action attempts to cure this admitted deficiency of Hill by relying on column 17, lines 22-30 of Hill, which allegedly teaches adding an additional beam-splitter into the beam splitter assembly in order to measure additional directions.

Even if Hill teaches the use of additional beam-splitters in the beam splitter assembly, which Applicant does not concede, there is nothing within this cited portion of Hill to teach or suggest at least the aspect wherein said plurality of radiation beams comprises at least three first radiation beams arranged to occupy a polygonal volume and at least one second radiation beam arranged to be in a position outside the polygonal volume as recited in claim 8. Just because adding additional beam-splitters to Hill's arrangement may be possible, the Office Action has not provided any teaching or reasoned basis within Hill to arrange the radiation beams in the manner recited in claim 8, and similarly recited in claims 16 and 23. The Examiner is reminded that "[the] mere fact that references <u>can</u> be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." The motivation recited in the Office Action fails to provide reasoning, within the references or otherwise, for modifying Hill. Accordingly, it appears as though the rejection is improperly based on hindsight reconstruction to allegedly arrive at Applicant's claimed invention.

Therefore, for at least the above reasons, Applicant respectfully submits that the rejections of claims 8, 16 and 23 under 35 U.S.C. §103(a) based on Hill should be withdrawn and the claims be allowed.

Claims 5, 6, 13, 14, 20 and 21 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Hill in view of U.S. Patent No. 6,020,964 to Loopstra *et al.* ("Loopstra"). Applicant respectfully traverses this rejection because a *prima facie* case of obviousness has not been established.

Dependent claims 5-6, 13-14 and 20-21 are allowable at least by virtue of their dependency from claims 3, 11 and 18, respectively, and for the additional features they recite. As noted above, the cited portions of Hill fail to disclose, teach or suggest claims 3, 11 and 18. Moreover, the cited portions of Loopstra fail to cure the deficiencies of Hill.

Even assuming the cited portions of Hill are properly combinable with those of Loopstra, which Applicant does not concede, the alleged combination would still fail to disclose, teach or suggest all the features of the claim. The cited portions of Loopstra teach an interferometer system 101 including a polarization-sensitive splitting prism 201, having an interface 202 for splitting radiation beams b_{25}, b_{20} from sources 229, 225, respectively, a reference reflector 205 and a Z reflector 164 for measuring displacement of a measuring mirror R_1, having Z measuring mirror R_3. Beam b_{25} is split by the interface 202 into a reference component that is reflected off of the reference reflector 205 and a measuring component that is incident on the Z measuring mirror R_3 and reflected off of Z reflector 164. Beam b_{20} is split by the interface 202 into a reference component that is reflected off of the reference reflector 205 and a measuring component that is incident on the measuring mirror R_1. *See*, column 20, lines 12-50 and Figure 11 of Loopstra. The reference components of beam b_{25} and of beam b_{20} exit the prism 201 in the **same direction**. This is in striking contrast to claim 3 in which the second reference beam associated with the at least one second beam, which second reference beam has been split by the same beam-splitting surface, exits the first reflector in a ***direction substantially orthogonal*** to the direction of the first reference beam associated with the at least one first beam that exits the beam-splitter block and away from the beam-splitter block.

Thus, any proper combination of the cited portions of Hill and Loopstra, cannot result in any way, in the invention of claim 3. Dependent claims 5 and 6 are allowable at least by virtue of their dependency from claim 3, and for the additional features they recite.

As noted above, the cited portions of Hill fail to disclose, teach or suggest claim 11. Similarly, as discussed above, the cited portions of Loopstra fail to remedy the defects of Hill. Specifically, the cited portions of Loopstra fail to disclose, teach or suggest a lithographic

apparatus comprising, *inter alia*, an interferometer system configured to measure displacement of one of the supports, wherein said interferometer system comprises, at least one measuring mirror fixedly connected to the one of the supports, said at least one measuring mirror comprising a plurality of measuring mirror areas; at least one reference mirror comprising one or more reference mirror areas that are configured to prevent beams from passing through said reference mirror; a beam generator configured to generate a plurality of beams, said beam generator comprising a beam-splitter block having a beam-splitting surface; and a plurality of radiation-sensitive detectors configured to convert radiation beams reflected towards said detectors into electric measuring signals, wherein said beam-splitting surface of the beam-splitter block is configured to split at least one first beam of said plurality of radiation beams into a first measuring beam and a first reference beam, said first reference beam only being reflected by one or more first reference mirrors located in a fixed position with respect to said beam-splitter block, said first measuring beam being reflected by a first measuring mirror area of said plurality of measuring mirror areas, wherein said beam-splitting surface of the beam-splitter block is configured to split at least one second beam of said plurality of radiation beams into a second measuring beam and a second reference beam, said second measuring beam being reflected by a second measuring mirror area of said plurality of measuring mirror areas, and said second reference beam being reflected by a first reflector that is fixedly positioned with respect to said beam-splitter block and by at least one third mirror area, which is movable with respect to said beam-splitter block, and wherein, in use, the second reference beam associated with the at least one second beam exits the first reflector in direction substantially orthogonal to the direction the first reference beam associated with the at least one first beam exits the beam-splitter block and away from the beam-splitter block, as recited in claim 11.

Thus, even assuming the cited portions of Hill are properly combinable with those of Loopstra, which Applicant does not concede, the alleged combination would still fail to disclose, teach or suggest all the features of the claim. Dependent claims 13 and 14 are allowable at least by virtue of their dependency from claim 11, and for the additional features they recite.

As noted above, the cited portions of Hill fail to disclose, teach or suggest claim 18. Similarly, as discussed above, the cited portions of Loopstra fail to remedy the defects of Hill. Specifically, the cited portions of Loopstra fail to disclose, teach or suggest a device

manufacturing method comprising, *inter alia*, determining a position of one of the supports with an interferometer system, the determining including splitting at least a first beam of a plurality of beams, using a beam-splitting surface of a beam-splitter block, into a first measuring beam and a first reference beam, said first reference beam only being reflected by one or more first reference mirrors located in a fixed position with respect to said beam-splitter block, said first measuring beam being reflected by a first measuring mirror area of a plurality of measuring mirror areas, the plurality of measuring mirror areas part of at least one measuring mirror fixedly connected to the one of the supports, and splitting at least a second beam of said plurality of beams, using the beam-splitting surface of the beam-splitter block, into a second measuring beam and a second reference beam, said second measuring beam being reflected by a second measuring mirror area of said plurality of measuring mirror areas, and said second reference beam being reflected by a first reflector that is fixedly positioned with respect to said beam-splitter block and by at least one third mirror area, which is movable with respect to said beam-splitter block, and said second reference beam being reflected in a substantially orthogonal direction with respect to the first reference beam by the first reflector and away from the beam-splitter block, and converting beams which are reflected towards detectors into electric measuring signals, as recited in claim 18.

Thus, even assuming the cited portions of Hill are properly combinable with those of Loopstra, which Applicant does not concede, the alleged combination would still fail to disclose, teach or suggest all the features of the claim. Dependent claims 20 and 21 are allowable at least by virtue of their dependency from claim 18, and for the additional features they recite.

Therefore, for at least the above reasons, Applicant respectfully submits that the rejections of claims 5-6, 13-14, 20 and 21 under 35 U.S.C. §103(a) based on Hill and Loopstra should be withdrawn and the claims be allowed.

Having addressed each of the foregoing rejections, it is respectfully submitted that a full and complete response has been made to the outstanding Office Action and, as such, the application is in condition for allowance. Notice to that effect is respectfully requested.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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